

Title (en)

Wood protection against microorganisms by laccase-catalysed iodination

Title (de)

Holzschutz gegen Mikroorganismen durch laccase-katalysierte Iodinierung

Title (fr)

Protection du bois contre les micro-organismes par iodation catalysée de laccase

Publication

**EP 2666360 A1 20131127 (EN)**

Application

**EP 12004058 A 20120524**

Priority

EP 12004058 A 20120524

Abstract (en)

A method for protecting a phenolic substances comprising material like wood against vermins, in particular microorganisms, comprises treating said phenolic substances comprising material with iodide in the presence of laccase, in particular with a liquid composition comprising iodide and laccase. Materials like wood treated by this method can be used as such or - if in form of small peaces like shavings or wood flour - together with a binder for protective coatings and/or laminates like antibacterial wood fibre plates, inner or outer panelling, wallpapers, and packagings.

IPC 8 full level

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CPC (source: EP US)

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Citation (applicant)

- US 4465864 A 19840814 - COOPER GEOFFREY K [US], et al
- BAKKALI, F.; S. AVERBECK; D. AVERBECK; M. WAOMAR: "Biological effects of essential oils - A review", FOOD CHEM TOXICOL, vol. 46, 2008, pages 446 - 475
- DORMAN, H. J. D.; S. G. DEANS: "Antimicrobial agents from plants: antibacterial activity of plant volatile oils", J APPL MICROBIOL, vol. 88, 2000, pages 308 - 316
- HAMMER, K. A.; C. F. CARSON; T. V. RILEY: "Antimicrobial activity of essential oils and other plant extracts", J APPL MICROBIOL, vol. 86, 1999, pages 985 - 990
- MAOZ, M.; C. FREITAG; J. J. MORRELL: "Potential synergy between natural product extracts for limiting fungal decay", INT J RES GROUP WOOD PRESERV, vol. IRG/WP 0, 2009
- RATIO, M.; A. C. RITSCHKOFF; L. VIIKARI: "Enzymatically polymerized phenolic compounds as wood preservatives", HOLZFORSCHUNG, vol. 58, 2004, pages 440 - 445
- VANNESTE, J. L.; R. A. HILL; S. J. KAY; R. L. FARRELL; P. T. HOLLAND: "Biological control of sapstain fungi with natural products and biological control agents: a review of the work carried out in New Zealand", MYCOL RES, vol. 106, 2002, pages 228 - 232
- ELEGIR, G.; A. KINDL; P. SADOCCO; M. ORLANDI: "Development of antimicrobial cellulose packaging through laccase-mediated grafting of phenolic compounds", ENZYME MICROB TECHNOL, vol. 43, 2008, pages 84 - 92
- SCHRÖDER, M.; N. AICHERNIG; G. M. GÜBITZ; V. KOKOL: "Enzymatic coating of lignocellulosic surfaces with polyphenols", BIOTECHNOL J, vol. 2, 2007, pages 334 - 341
- PARK, E. S.; W. S. MOON; M. J. SONG; M. N. KIM; K. H. CHUNG; J. S. YOUNG: "Antimicrobial activity of phenol and benzoic acid derivatives", INT BIODET BIODEGRAD, vol. 47, 2001, pages 209 - 214
- VODA, K.; B. BOH; M. VRTACNIK; F. POHLEVEN: "Effect of the antifungal activity of oxygenated aromatic essential oil compounds on the white-rot Trametes versicolor and the brown-rot Coniophora puteana", INT BIODETER BIODEGR, vol. 51, 2003, pages 51 - 59
- BOLLAG, J. M.; A. LEONOWICZ: "Comparative Studies of Extracellular Fungal Laccases", APPL ENVIRON MICROBIOL, vol. 48, 1984, pages 849 - 854
- IHSSEN, J.; M. SCHUBERT; F. W. M. R. SCHWARZE; L. TH6NY-MEYER: "Efficient production of Al(OH)3-immobilized laccase with a Heterobasidion annosum strain selected by microplate screening", J APPL MICROBIOL, vol. 110, 2011, pages 924 - 934
- THURSTON, C. F.: "The structure and function of fungal laccases", MICROBIOLOGY, vol. 140, 1994, pages 19 - 26
- CANAS, A. I.; S. CAMARERO: "Laccases and their natural mediators: Biotechnological tools for sustainable eco-friendly processes", BIOTECHNOL ADV, vol. 28, 2010, pages 694 - 705
- BARRECA, A. M.; M. FABBRINI; C. GALLI; P. GENTILI; S. LJUNGGREN: "Laccase-mediated oxidation of a lignin model for improved delignification procedures", J MOL CATAL B: ENZY, vol. 26, 2003, pages 105 - 110
- DROUHET, E.; D. BERTRAND: "Evolution of antifungal agents: past, present, and future", REV INFECT DIS, vol. 9, 1987, pages S4 - S14
- KULYS, J.; I. BRATKOVSKAJA; R. VIDZIUNAITE: "Laccase-catalysed iodide oxidation in presence of methyl syringate", BIOTECHNOL BIOENG, vol. 92, 2005, pages 124 - 128
- XU, F.: "Catalysis of novel enzymatic iodide oxidation by fungal laccase", APPL BIOCHEM BIOTECHNOL, vol. 59, 1996, pages 221 - 230
- CHOI, S.; J. G. MCCOMB; M. L. LEVY; I. GONZALEZ-GOMEZ; R. BAYSTON: "Use of elemental iodine for shunt infection prophylaxis", NEUROSURGERY, vol. 52, 2003, pages 908 - 912
- SCHUBERT, M.; T. VOLKMER; C. LEHRINGER; F. W. M. R. SCHWARZE: "Resistance of bioincised wood treated with wood preservatives to blue-stain and wood-decay fungi", INT BIODET BIODEGRAD, vol. 65, 2011, pages 108 - 115
- HERPOEL, I.; S. MOUKHA; L. LESAGE-MEESSEN; J. SIGOILLOT; M. ASTHER: "Selection of Pycnoporus cinnabarinus strains for laccase production", FEMS MICROBIOL. LETT., vol. 183, 2000, pages 301 - 306
- LOMASCOLO, A.; E. RECORD; I. HERPOEL-GIMBERT; M. DELATTRE; J. L. ROBERT; J. GEORIS; T. DAUVRIN; J. C. SIGOILLOT; M. ASTHER: "Overproduction of laccase by a monokaryotic strain of Pycnoporus cinnabarinus using ethanol as inducer", J APPL MICROBIOL, vol. 94, 2003, pages 618 - 624
- KUDANGA, T.; E. N. PRASETYO; J. SIPILA; P. NOUSIAINEN; P. WIDSTEN; A. KANDELBAUER; G. S. NYANHONGO; G. GUEBITZ: "Laccase-mediated wood surface functionalization", ENG LIFE SCI, vol. 8, 2008, pages 297 - 302
- ALCALDE, M.; T. BULTER: "Directed Enzyme Evolution: Screening and Selection Methods", vol. 230, 2003, article "Colorimetric assays for screening laccases", pages: 193 - 201
- BOURBONNAIS, R.; M. G. PAICE: "Oxidation of nonphenolic substrates - an expanded role for laccase in lignin biodegradation", FEBS LETT, vol. 267, 1990, pages 99 - 102
- CAMARERO, S.; D. IBARRA; M. J. MARTINEZ; A. T. MARTINEZ: "Lignin-derived compounds as efficient laccase mediators for decolorization of different types of recalcitrant dyes", APPL ENVIRON MICROBIOL, vol. 71, 2005, pages 1775 - 1784

- MÜLLER, C.; M. EURING; A. KHARAZIPOUR: "Enzymatic modification of wood fibres for activating their ability of self bonding", INT J MATER PROD TECHNOL, vol. 36, 2009, pages 189 - 199
- EURING, M.; M. RUHL; N. RITTER; U. KUES; A. KHARAZIPOUR: "Laccase mediator systems for eco- friendly production of medium-density fiberboard (MDF) on a pilot scale: Physicochemical analysis of the reaction mechanism", BIOTECHNOL J, vol. 6, 2011, pages 1253 - 1261
- EUROPEAN COMMITTEE FOR STANDARDIZATION: "Wood preservatives - Accelerated aging of treated wood prior to biological testing - Leaching procedure.", EUROPEAN STANDARD EN 84,, 1997
- EUROPEAN COMMITTEE FOR STANDARDISATION: "Test methods for wood preservative - laboratory method for determining the preventive effectiveness treatment against blue stain in service - Part 2: other methods", EUROPEAN STANDARD EN 152, 1988
- EUROPEAN COMMITTEE FOR STANDARDIZATION: "Wood preservatives. Test method for determining the protective effectiveness against wood destroying basidiomycetes-determination of the toxic values", EUROPEAN STANDARD EN 113, 1997
- THWAITES, J. M.; R. L. FARRELL; K. HATA; P. CARTER; M. LAUSBERG: "Sapstain fungi on Pinus radiata logs - from New Zealand Forest to export in Japan", J WOOD SCI, vol. 50, 2004, pages 459 - 465
- DHAR, N. R.: "The starch-iodine reaction", J PHYS CHEM, vol. 28, 1923, pages 125 - 130
- EILERS, P. H. C.: "Parametric time warping", ANAL CHEM, vol. 76, 2004, pages 404 - 411
- EILERS, P. H. C.: "A perfect smoother", ANAL CHEM, vol. 75, 2003, pages 3631 - 3636
- SAVITZKY, A.; M. J. E. GOLAY: "Smoothing and differentiation of data by simplified least squares procedures", ANAL CHEM, vol. 36, 1964, pages 1627 - 1639
- PANDEY, K. K.; A. J. PITMAN: "FTIR studies of the changes in wood chemistry following decay by brown-rot and white-rot fungi", INT BIODET BIODEGRAD, vol. 52, 2003, pages 151 - 160
- DENG, Y.; FENG, X.; ZHOU, M.; QIAN, Y.; YU, H.; X. QIU.: "Investigation of aggregation and assembly of alkali lignin using iodine as a probe", BIOMACROMOLECULES, vol. 12, 2011, pages 116 - 1125
- ZAKZESKI, J.; BRUIJNINCX, P.C.A.; JONGERIUS,A.L.; B.M. WECKHUYSEN.: "The catalytic valorization of lignin for the production of renewable chemicals", CHEM REV, vol. 110, 2010, pages 3552 - 3599

Citation (search report)

- [XI] WO 03090542 A1 20031106 - NOVOZYMES AS [DK], et al
- [Y] WO 9616165 A1 19960530 - NOVO NORDISK BIOTECH INC [US]
- [Y] JAY E. TAYLOR ET AL: "The Mechanism of the Iodination of Phenols", THE OHIO JOURNAL OF SCIENCE, vol. LIII, no. 1, 1 January 1953 (1953-01-01), pages 37 - 41, XP055042086, ISSN: 0030-0950

Cited by

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